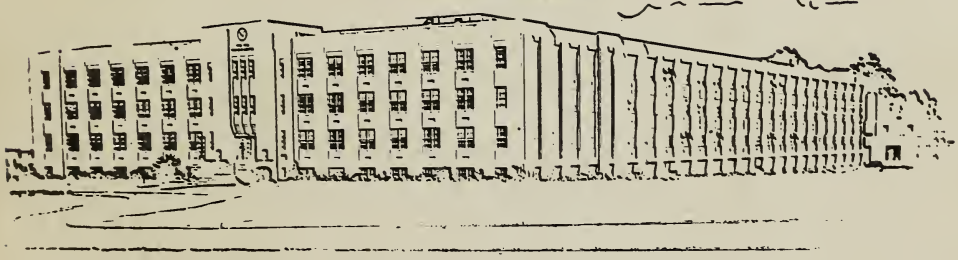
WESTERN UTILIZATION RESEARCH BRANCH

M. J. COPLEY, Chief



AGRICULTURAL RESEARCH SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

ORGANIZATION

United States Department of Agriculture

EZRA TAFT BENSON
Secretary of Agriculture

ERVIN L. PETERSON
Assistant Secretary of Agriculture, Federal-States Relations

AGRICULTURAL RESEARCH SERVICE (Washington, D. C.)

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Administrator

GEORGE W. IRVING, JR.
Deputy Administrator, Research

G. E. HILBERT
Director of Utilization Research

J. R. MATCHETT
Assistant Director

WALTER M. SCOTT
Assistant Director

WESTERN UTILIZATION RESEARCH BRANCH

M. J. COPLEY
Chief

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Assistant Chief

J. E. SIMPSON
Assistant to the Chief

I. J. GIRGICH
Administrative Officer

WILLIAM TAKACS
Patents

R. H. NAGEL
Technical Assistant to the Chief

P. L. BLAKE
Mechanical Superintendent

R. T. PRESCOTT
Publications

RESEARCH SECTION HEADS:

C. H. KUNSMAN
Analytical, Physical-Chemical, & Physics

W. D. RAMAGE
Engineering & Development

G. O. KOHLER
Field Crops Utilization

E. F. JANSEN
Fruit Processing

F. DeEDS
Pharmacology

H. LINEWEAVER
Poultry Products

H. P. LUNDGREN
Protein

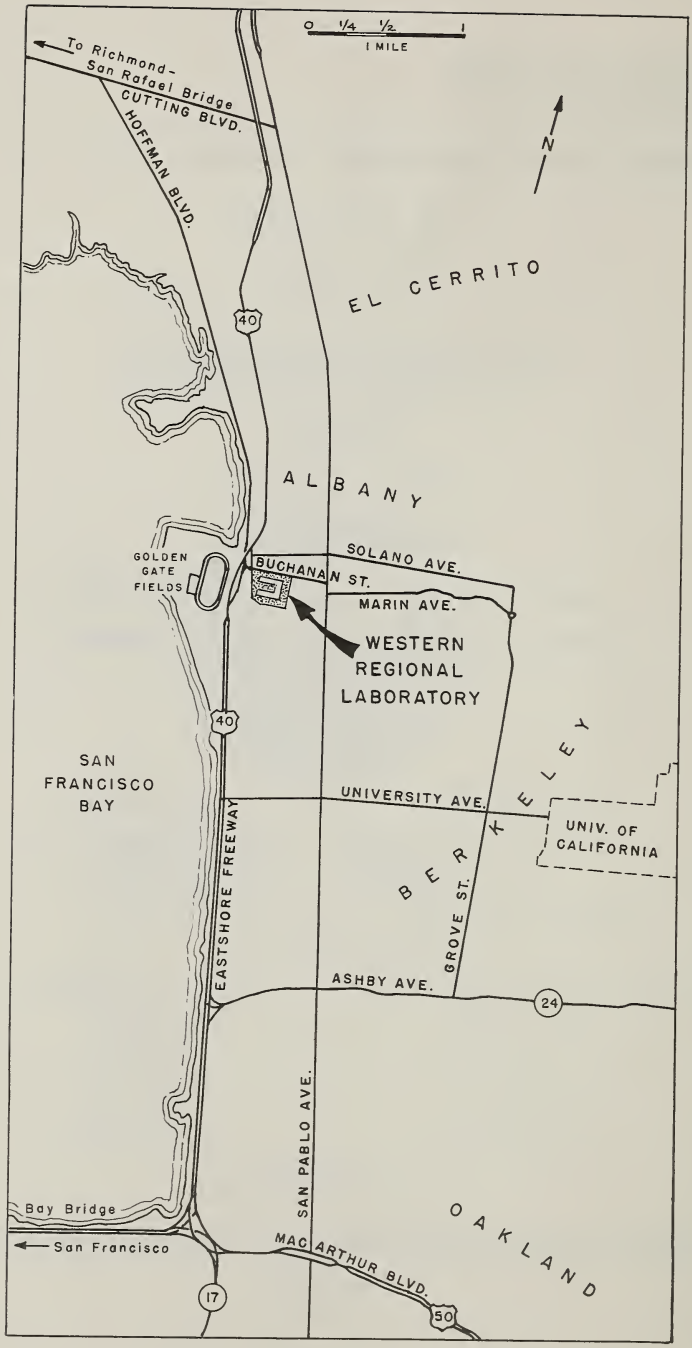
W. F. TALBURT
Vegetable Processing

E. A. BEAVENS
Subtropical Products (Pasadena)

Fruit and Vegetable Products Laboratories • Prosser & Puyallup, Wash.

A. M. NEUBERT
In Charge

— July 1956 —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BERKELEY
UNIV. OF
CALIFORNIA
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GROVE ST.
ASHBY AVE.
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SAN PABLO AVE.
Bay Bridge
San Francisco
MACARTHUR BLVD.
OAKLAND
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VISITORS WELCOME

VISITORS are always welcome. Conferences can be arranged with staff members in fields of particular interest. Groups will be given conducted tours of the laboratories. Arrangements for visits should be made in advance with either the Chief, Section Heads, or other administrative personnel listed on page 1 in order to assure seeing and discussing the phases of the research program of most interest.

WESTERN UTILIZATION RESEARCH BRANCH

Headquarters: Western Regional Laboratory
800 Buchanan Street
Albany 10, California

Telephone: LAndscape 5-2244

Hours: 8:30 a.m. to 5 p.m. — Monday through Friday

Location and Transportation: Albany is across the bay from San Francisco and north of Oakland and Berkeley. The Laboratory is near the Bay Shore and is only a few blocks from U. S. Highway 40. Local buses are available from Oakland, Berkeley, and the San Francisco areas. From San Francisco, buses traveling to Albany leave from the Bridge Terminal.

Other Laboratories:

Fruit and Vegetable Chemistry Laboratory
263 South Chester Ave., Pasadena, California
Telephone — SYcamore 6-0239

Fruit and Vegetable Products Laboratories
Prosser and Puyallup, Washington (in cooperation with Washington State Agricultural Experiment Stations)
Telephone — 5512 (Prosser)
5-6613 (Puyallup)

ORIGIN

IN 1938 Congress provided for four regional research laboratories to search for new and wider outlets and markets for farm commodities. The substance of the legislation is contained in the following paragraph:

"The Secretary is hereby authorized and directed to establish, equip, and maintain four regional research laboratories, one in each major farm producing area, and at such laboratories to conduct researches into and to develop new scientific, chemical, and technical uses and new and extended markets and outlets for farm commodities and products and byproducts thereof. Such research and development shall be devoted primarily to those commodities in which there are regular or seasonal surpluses, and their products and byproducts."

Subsequently Congress enacted legislation called the "Research and Marketing Act of 1946" which authorized additional research on the utilization of farm commodities.

ADMINISTRATION

THE AGRICULTURAL Research Service is one of the agencies comprising the functional group known as Federal-States Relations in the U. S. Department of Agriculture. The central offices for the Agricultural Research Service are located in Washington, D. C.

The Laboratory in Albany, California, is the headquarters for the Western Utilization Research Branch, one of four utilization research branches in the Agricultural Research Service. The other three branches are the Northern Branch in Peoria, Illinois; the Southern Branch in New Orleans, Louisiana; and the Eastern Branch in Philadelphia, Pennsylvania.

The organization of the Western Utilization Research Branch, and also the administrative officers in the Agricultural Research Service and the Department under whom the Branch is organized, are shown on page 1. General information regarding all the Branches is on the last page.

PHYSICAL FACILITIES

THE MAIN building of the Western Regional Laboratory has three stories and basement, built in the form of a "U," with administrative activities in the base of the "U" and research work in the two wings. Each floor contains over 40,000 sq. ft. There are special conference rooms and a technical library. In one wing there is a large room, extending the full height of the building, where engineering laboratory operations, in some cases on a pilot-plant scale, are conducted.

There are about a hundred and fifty laboratory rooms, many of which house highly specialized apparatus. There are more than 25 rooms which have controlled temperatures, ranging from —30° F. to elevated temperatures such as those found in the hottest climates. One of the places of special interest to most visitors is the Food Processing Laboratory, in which various agricultural products are frozen, dried, canned, or otherwise processed by the many experimental procedures that are undergoing research and development. The mechanical shops are located in the basement.

RESEARCH PROGRAM

AGRICULTURE vitally affects the people in all parts of the Nation. As an aid in the guidance of its research programs, the Department of Agriculture seeks advice and assistance from many sources. Under the Research and Marketing Act of 1946 a number of advisory committees have been established. Members of these groups are chosen

WESTERN REGIONAL LABORATORY
800 Buchanan Street
Albany, California

by the Secretary of Agriculture so that a sound representation is obtained for all major interests — farmers, handlers, processors, transportation and storage groups, distributors, and ultimate consumers.

At present twenty-six advisory and functional committees (composed of nine to fifteen members) review and make recommendations concerning the programs of utilization research and also other programs of the Department of Agriculture. There are also four committees that coordinate the joint research programs between the States and the Department. From time to time temporary committees are established to help solve special problems that may arise.

The Research and Marketing Act of 1946 also enables the Department of Agriculture to contract with outside scientific organizations for research on certain projects — particularly those that require personnel and facilities that are not available within the Department. The branches of the Agricultural Research Service arrange for and supervise contract projects that are conducted in State experiment stations or private research organizations. Contract researches thus expand the scope of the research programs.

Each of the utilization research branches engages in research on assigned commodities. In many instances an agricultural commodity may be of such widespread economic

importance, with problems peculiar to the geographic areas, that research is done on the commodity by more than one of the branches. Those assigned to the Western Branch are:

FRUITS AND TREE NUTS **VEGETABLES**

WHEAT AND RICE **POULTRY AND EGGS**

WOOL AND MOHAIR **SUGAR BEETS**

ALFALFA AND OTHER FORAGE CROPS

These are major crops in the area primarily served by the Western Branch — Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Hawaii, and Alaska. Close relations, through collaborative research and conferences, are maintained between the Western Utilization Research Branch and the respective State Agricultural Experiment Stations.

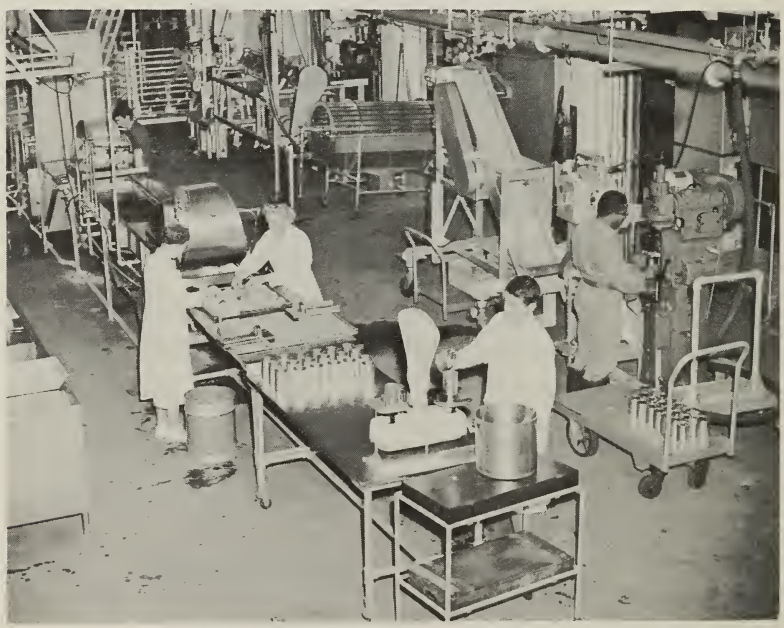
There are eight research sections in the laboratory at Albany, one research section in the laboratory in Pasadena, and research groups in Prosser and Puyallup, Washington. Each section is further subdivided into two or more subject-matter units as indicated in the following listing of Sections. Names of the heads of the sections are listed on page 1. A brief description of each section follows.

FRUIT PROCESSING SECTION

Products, Fruit Flavor, Fruit Texture and Color, Product Stability, and Enzymes Units —

Conducts fundamental and applied research upon: raw material characteristics; enzyme activity; freezing, canning, dry-

ing, and modifications of these processes in food preservation; recovery and utilization of volatile flavors; and composition factors affecting appearance and stability. Develops new technology for the production of high-quality powders and concentrates from fruit juices. Conducts a broad investigation to determine the effects of various time and temperature conditions upon frozen fruit products as a basis for improvement of processing procedures, and makes available information useful in improvement of handling practices for these commodities. Does research to improve preservation techniques and to develop new products as a means of increasing utilization of fruits.



Processing research to develop better Fruit, Vegetable, and other Agricultural products.

VEGETABLE PROCESSING SECTION

Frozen and Canned Products, Dehydrated Products, Raw Material, Appraisal, and Biochemical Units —

Does fundamental and applied research on vegetables and vegetable products, including potatoes and dry beans and peas. In many respects the studies parallel those conducted on fruits by the Fruit Section. In addition, as a part of broad investigations of means for minimizing food spoilage, studies are made of the potential roles of antibiotics alone and in conjunction with heating, freezing, drying, and radiation treatments for improving food preservation. Basic investigations on the heat resistance of spores are being conducted; the objective is reduction of processing times and temperatures for vegetables.

POULTRY PRODUCTS SECTION

Poultry Meat, Microbiology, Egg, and Cooked Products Units —

Conducts research on maintaining prime quality of poultry and egg products through improvement of processing procedures. Investigates effects of varying time and temperature conditions on quality of frozen poultry products. Research encompasses the technologies of killing, dressing, freezing, precooking, canning, egg breaking and drying, sanitation, and use of wastes. Rational bases for improvements are sought through chemical, physical, biochemical, microbiological, and organoleptic (taste and flavor) investigations of the components

of poultry and eggs, and of the changes these components may undergo that in any way affect the quality and useful properties of these commodities.

A trained taste panel evaluates flavors and textures of products. This research technique affords another link between fundamental research, process and product development, and ultimate consumer acceptance of foods.

FIELD CROPS UTILIZATION SECTION

Sugar Beet, Alfalfa, Rice, and Wheat Units —

Investigates means for achieving desired operational and quality control in the manufacture of beet sugar and carries out basic and applied research on processing operations. Conducts studies for the preservation of forage nutrients such as

vitamins as a means of improving and increasing animal and poultry feed supplies. Investigates the chemical composition of fresh and processed forages, especially with relation to the physiologically active components such as those that interfere with normal life process or that stimulate growth in animals that eat them. Develops new processes for making parboiled (grain pre-cooked in the hull) and "instant" rice products, and studies methods for improving the stability of rice and rice products. Does research on wheat, especially concerning the relation of protein composition and properties to milling and baking qualities. Investigates the freezing preservation of baked goods, and studies new products from wheat.

PROTEIN SECTION

Fiber Properties and Chemical Modification Units —

Does fundamental and applied research to improve the usefulness of wool and mohair. Fundamental investigations of chemical composition, physical structure, and quality evaluation are aimed to provide basic information necessary to the broadened utilization of these animal fibers by: (a) improvement of fiber characteristics through chemical and other modifications, (b) improvement of processing techniques, (c) development of information useful to better servicing of finished items, and (d) development of new and improved means of utilizing the waste products.

ENGINEERING AND DEVELOPMENT SECTION

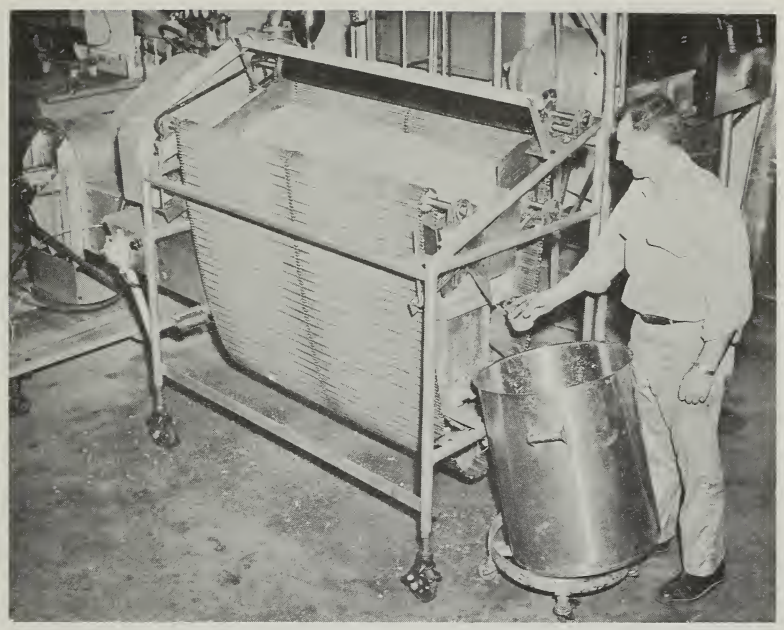
Process Research, Food Processing, Equipment Research, and Industrial Analysis Units —

Develops commercial processes for agricultural products and byproducts — principally fruits and vegetables — through pilot plant operations. Designs, constructs, and tests research and processing equipment. Prepares plant layouts for new or improved processes, and makes cost analyses for manufacturing agricultural products where these processes are used. Fields of work include: pasteurizing, sterilizing, and concentrating fluid-form products; dehydration of fruit, vegetable, egg products, and rice; dehydrocanning and dehydrofreezing; recovery, fractionation, and utilization of volatile fruit flavors; processing of sugar beets.

ANALYTICAL, PHYSICAL-CHEMICAL, AND PHYSICS SECTION

Analytical, Physical Chemical, and Physics Units —

Applies and develops physical and chemical analytical procedures including micro-chemical, x-ray, crystallographic, microscopic, light scattering, fluorometric, colorimetric, spectrophotometric, ultraviolet, infrared, spectrochemical, radioisotopic, electronic, paramagnetic and nuclear magnetic resonance, chromatographic, and ion exchange methods. Pioneers in the development of new analytical procedures, a recent example being the use of nuclear magnetic resonance to determine the water content of various commodities.



BELT-TROUGH DRIER — Experimental model of a radically new and faster method for producing higher quality dried fruits and vegetables.

PHARMACOLOGY SECTION —

Makes pharmacological investigations for the utilization research program. Studies the acute and chronic toxicity, and when necessary, the metabollic fate, of new antibiotics, medicinals, pesticides, and various other compounds being evaluated for their agricultural and industrial usefulness. Investigates the physiological effects of specific chemical constituents of foods and feeds as a basis for improving agricultural products. Investigations include laboratory research and tests upon experimental laboratory animals.

SUBTROPICAL PRODUCTS SECTION
(Pasadena, California) —

This section does research principally on citrus, other subtropical fruits, and nuts, for the area comprising Southern California and Arizona, with the objective of broadening the utilization of these commodities. Minor constituents of these products are being identified to determine their effect on quality of processed products. New or improved citrus products are developed. Effects of insecticides and fungicides on processed products are studied. The time-temperature tolerance of frozen citrus juice concentrates is being determined. Other major investigations include tree nuts, dry lima beans, and tomato concentrates. The factors responsible for the deterioration of shelled walnuts and means of minimizing such deterioration are being extensively studied. The scope of the program includes both basic and applied research.

Fruit and Vegetable Products Laboratories of the Pacific Northwest —

This group carries on its research in two laboratories, one at Prosser and the other at Puyallup, Washington. Both laboratories are located in buildings owned and operated by the Agricultural Experiment Stations of the State College of Washington. The program includes: determination of processing characteristics of new varieties of fruits and vegetables; pre-

FRUIT AND VEGETABLE CHEMISTRY LABORATORY
263 South Chester
Pasadena, California

processing studies, such as cleaning methods for fresh commodities; and processing improvements, such as means for increasing retention of nutritive value and enhancing consumer appeal during processing operations. The objective of these investigations is to increase the utilization of fruits and vegetables of primary interest to the Pacific Northwest.

SOME PAST AND PRESENT ACTIVITIES OF THE WESTERN UTILIZATION RESEARCH BRANCH

Concentration of Foods —

During World War II the major portion of the research program was concerned with dehydrated foods, particularly vegetables and eggs. The work embraced suitability of raw materials, design of equipment and plants, pre-treatments such as blanching and application of sulfite, drying rates, packaging, production control methods, and stability studies of products as a guide for process improvement. Certain phases of this work have been continued. For example, marked improvement in stability of egg powder has been achieved since World War II — a major contribution to the increased use of prepared cooking mixes requiring eggs. Also, the development of improved dehydrated mashed potato (granules) has been an important step toward increasing the utilization of potatoes.

A new process, known as dehydrocanning, has been developed whereby the product is partially dried and then canned, thus incorporating the best features of two well established methods. Frozen concentrated juices (such as strawberry and apple) have been developed. Other new products are stable powdered forms of orange, lemonade, tomato, pineapple, and other juices which easily mix with water and make full-flavored beverages of high acceptability. Research is in progress to find better ways of making plum, apricot, and prune concentrates to broaden their utilization possibilities.

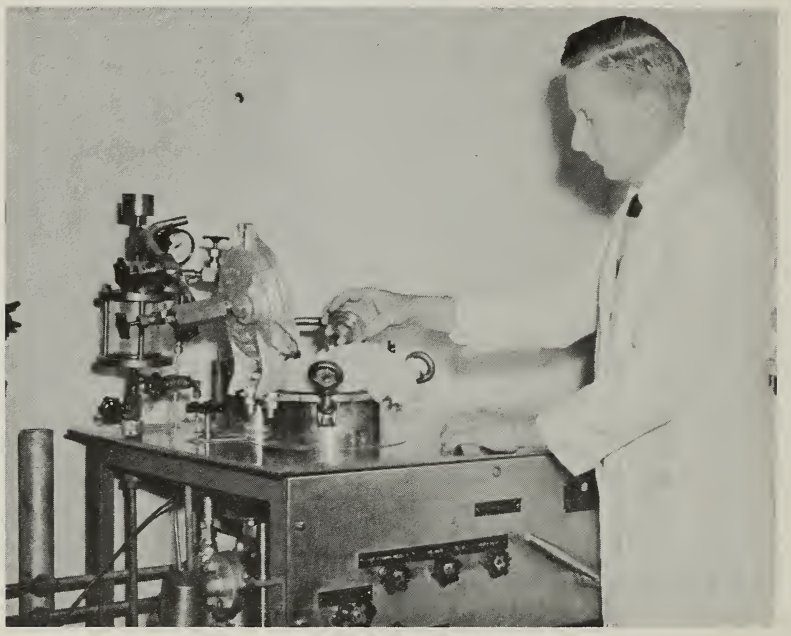
Freezing Preservation of Foods —

Researches on preservation of fruits, vegetables, poultry, eggs, and prepared foods by freezing occupy an important position in the Western Branch. A large project is under way to determine the effects of temperature fluctuations, such as usually encountered in the commercial handling, upon frozen fruits, citrus concentrates, vegetables, poultry products, and other frozen foods. Fundamental and development research applicable to the expanding new field of precooked frozen food items — ranging from gravies, sauces, and puddings to complete meals — is getting increased attention. Studies have been advanced on the frozen preservation of bread and other baked goods as a means of better utilizing wheat and other grains. A new process called dehydrofreezing (partial dehydration followed by freezing) offers promise for preserving the quality of fruits and vegetables intended for use in manufactured foods such as pies, soups, and cheese products. Dehydrofrozen pimientos, peas, and apples are among the first to be commercially available.

Wool —

Improved procedures have been devised for removing grease and suint from raw wool, for clarifying wool scouring liquors, and for felting of wool. New agents for reducing redeposition of soil in laundering have been developed. Several chemical modifications of wool have been developed

which give the fibers new and improved properties. Treatments are being studied to render wool more resistant to alkali and acid conditions often encountered in processing, and for better control of wool shrinkage during laundering.



Developing new and improved wool and mohair products through chemical modification.

Field Crops —

Alfalfa is one of the most important sources of protein, carotene, and other essential constituents for animal and poultry feeds. Processes have been developed which help solve two major problms for improving the usefulness of alfalfa: chemical additives for protecting the carotene content and treatments

for reducing dustiness of alfalfa meal. Studies to determine the bloat-causative factors in alfalfa are under way, with experimental evidence that the saponin content is contributive. Recently a compound found in alfalfa has been shown to have a marked growth-promoting effect on animals.

Fundamental research on individual WHEAT constituents provides better baking practices and products.

Research on wheat at this Branch includes exploratory investigations of the nature and other possible new uses of gluten, the characterization of the chemical factors responsible for baking behavior of different varieties of wheat, and chemical studies of important nutrient constituents (particularly lysine) of Western wheats.

New types of instant (quick-cooking) and par-boiled rice products have been developed. One of these, a process for canning white rice, is already in commercial use. A fundamental study of preprocessing conditions for whole rice is in progress.

New procedures are being developed for the extraction and purification of sugar from sugar beets.

Utilization of Wastes —

The utilization of wastes is of major importance in the processing of agricultural commodities. The Western Branch has developed methods which not only solve certain serious waste disposal problems, but at the same time afford possible ways of converting these troublesome wastes into products of economic value. For example, by such studies, canning sirup and a cattle feed material can be recovered from pear waste, and poultry feathers are converted to fertilizer and feed uses.

Fundamental Studies —

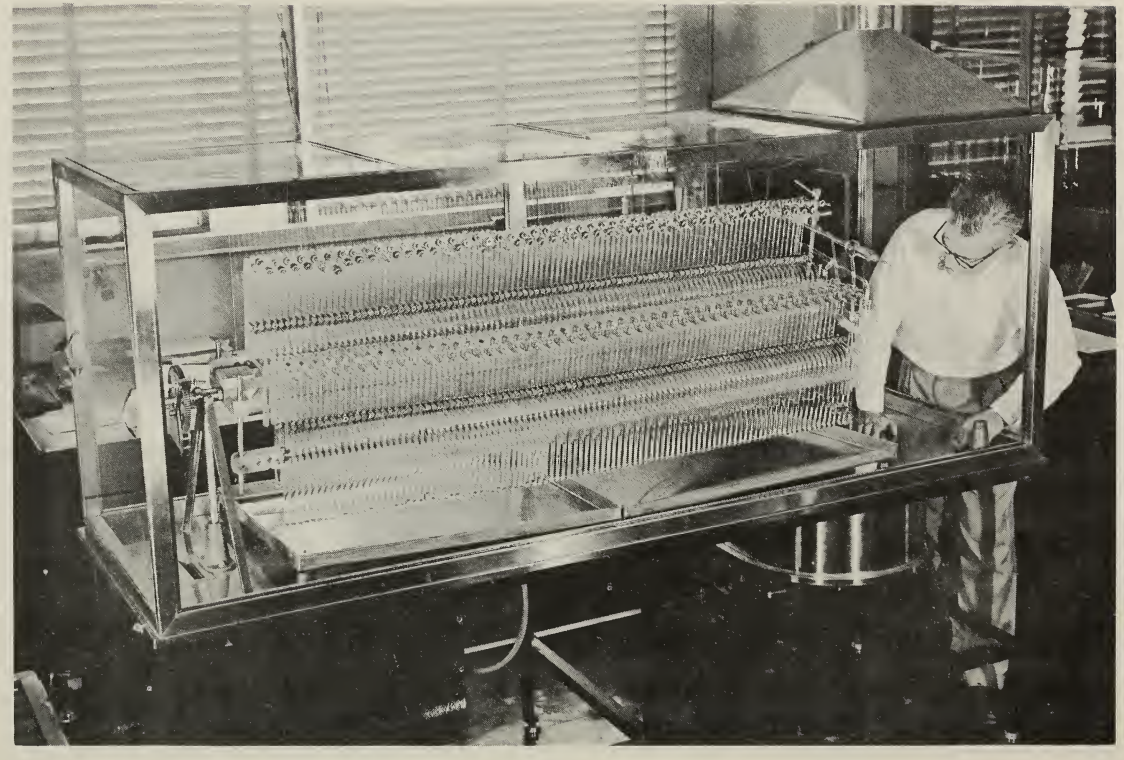
Development of new and improved uses for agricultural commodities is vitally dependent upon basic research. Basic information is the foundation for planned progress. Included in the utilization research program are many fundamental chemical and physical studies of agricultural raw materials and products. Such studies are not sharply differentiated from studies of commercial applications and processes but they

differ sufficiently to justify mention of several as being typical.

Research is in progress concerning the basic mechanisms of enzymatic and non-enzymatic changes in fruits and vegetables, particularly as related to changes in color, flavor, and texture characteristics. By use of such knowledge it will be possible to control darkening, minimize development of off-flavors during processing and storage, and prevent mushiness in processed commodities.

Determining the physiological roles ot naturally occurring minor constituents of agricultural commodities is becoming more important. Some of these rather minor constituents may have profound effects upon physiological processes. Through this knowledge means may be devised to eliminate the harmful factors and to enhance the beneficial ones. For example: recent chemical and pharmacological studies strongly indicate that saponin, a very minor constituent of green alfalfa and other legumes, is contributory to the bloating of cattle and other ruminants and has a growth-depressing effect in poultry when high levels of alfalfa meal are in the rations. Such findings will ultimately afford means of alleviating important problems in the feeding of livestock and poultry.

The identification and isolation of chemical constituents responsible for flavor in various commodities, and techniques for "locking" them into processed products are being expanded.



COUNTER-CURRENT DISTRIBUTION APPARATUS used for isolating trace constituents in agricultural commodities.

These basic studies are pointing the way toward more flavorful poultry, fruit, and vegetable products.

The short shelf-life of shelled walnuts has been a serious problem. Studies to determine the chemical reactions responsible for such deterioration have revealed specific corrective measures. Identification and determination of the physiological importance of various flavonoids in citrus fruits has been greatly aided by the development of new chromatographic analytical methods. A fundamental study of the yellowing of wool by light and its control by chemical treatment is in progress. Through basic research on natural and chemically modified wool fibers, the Western Branch is contributing information of much value to the spinning, weaving, and ultimate utilization of wool.

Studies are being undertaken to determine the minimum amounts of irradiation treatments required to effect practical sterilization or pasteurization of fruit, vegetable, poultry and egg products in their various commercial forms. The program includes investigations of and means for minimizing any serious side effects, such as off-flavor development and damage to properties, which irradiation treatments may cause in these products.

PUBLICATIONS AND PATENTS

THE Western Branch has been responsible for about 1500 publications since its establishment in 1941. Most of these supply practical information on results obtained in research projects; some are published in scientific journals for the benefit of other scientists. A list of current publications is issued every six months.

Often the research and development work results in discoveries that are patentable. In these cases, a patent assigned to the Secretary of Agriculture is obtained in the name of the person who made the invention. Individuals and organizations may obtain, without cost, a license from the Department to use the patented invention.

Nearly two hundred patents have been obtained since the Laboratory was established. These patents cover a wide range of subject matter, for example: food preparation and preservation (53 patents), food processing equipment (9), preparation and utilization of pectin and pectin derivatives (17), solubilization of keratins and preparation of other protein derivatives (17), preparation of antibiotic substances (15), processing of wool (7), stabilization of carotene in alfalfa (5), synthesis of new organic compounds (21), treatment of pear waste to recover useful products (2), and miscellaneous processes, products and equipment (38).

GENERAL INFORMATION ABOUT THE UTILIZATION RESEARCH BRANCHES

G. E. Hilbert, *Director of Utilization Research*
J. R. Matchett, *Assistant Director*
W. M. Scott, *Assistant Director*

Agricultural Research Service
U. S. Department of Agriculture
Washington, D. C.

Branch	*Chief of Branch*	*Mailing Address*	*Branch Area**	*Fields of Research*
Eastern	P. A. Wells	600 East Mermaid Lane Philadelphia 18, Pa.	Conn., Del., Maine, Ky., Md., Mass., N.H., N.J. N.Y., Pa., R.I., Vt., Va., W. Va.	Eastern vegetables and deciduous fruits; meat, fats and leather; dairy products; honey and maple products; tobacco; wool byproducts; plant sources of biologically active compounds.
Northern	W. D. Maclay	1815 North University St. Peoria 5, Illinois	Ill., Ind., Iowa, Kans., Mich., Minn., Mo., Nebr., N. Dak., Ohio, S. Dak., Wis.	Corn, wheat, and other cereal crops; soybeans and other oilseed crops; agricultural residues.
Southern	C. H. Fisher	1100 Robert E. Lee Blvd. New Orleans 19, La.	Ala., Ark., Fla., Ga., La., Miss., Okla., S.C., N.C., Tenn., Texas.	Cotton and cottonseed; tung fruit; peanuts; rice; sugarcane; pine gum; citrus fruits; sweetpotatoes, cucumbers, and other vegetables.
Western	M. J. Copley	800 Buchanan Street Albany 10, California	Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., Oreg., Utah, Wash., Wyo. Hawaii, Alaska.	Western fruits and tree nuts; Western vegetables; poultry products; alfalfa and other forage crops; wheat; rice; wool and mohair; sugar beets; and dry beans and peas.

*States listed are those primarily served by the particular Branch, although the research programs of each Branch are of national scope and interest.

Notes

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